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**SYSTEMATIC REVIEW**

# Simplified versus traditional techniques for complete denture fabrication: A systematic review



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Complete edentulism is an important public health problem, especially among the elderly.<sup>1,2</sup> The prevalence of total edentulism in seniors has been estimated to be 26% in the United States, 15% to 78% in Europe, 24% in Indonesia, 11% in China, and 23% in Brazil.<sup>3,4</sup> Millions of individuals all over the world need removable complete dentures.<sup>5,6</sup> Despite the existence of alternative techniques, such as implant-retained prostheses, the great majority of patients will continue to wear conventional dentures, particularly due to cost and the lack of access to care.<sup>1,6-8</sup> Thus, society's need for conventional complete dental prostheses will remain for the foreseeable future.<sup>1,6,7</sup> A number of methods have been described for the fabrication of complete dentures<sup>3</sup>; two most common ways are the traditional method and the simplified method. The traditional method, which uses more complex and time-consuming techniques, is taught in most dental schools.<sup>9</sup> Meanwhile, most general dentists treat patients who are edentulous with simplified techniques to reduce the number of visits and the time required to make the prostheses.<sup>1-3,6-8</sup>

Most assessments of the techniques have been through case reports or retrospective studies, which cannot provide high levels of evidence regarding the effect of a treatment. Questions regarding the efficacy or effectiveness of a treatment can be better answered by randomized trials and systematic reviews.<sup>1,8</sup> Therefore, this systematic review aimed to investigate the efficiency of simplified methods for fabricating dentures compared with traditional methods. The traditional method for complete denture treatment includes the following clinical stages: anatomic and functional impression,

## ABSTRACT

**Statement of problem.** A number of methods have been described for the fabrication of complete dentures. There are 2 common ways to make conventional complete dentures: a traditional method and a simplified method.

**Purpose.** The purpose of this study was to conduct a systematic review to compare the efficiency of simplified and traditional methods for the fabrication of complete dentures.

**Material and methods.** The review was conducted by 3 independent reviewers and included articles published up to December 2013. Three electronic databases were searched: MEDLINE-PubMed, The Cochrane Library, and ISI Web of Science. A manual search also was performed to identify clinical trials of simplified versus traditional fabrication of complete dentures.

**Results.** Six articles were classified as randomized controlled clinical trials and were included in this review. The majority of the selected articles analyzed general satisfaction, denture stability, chewing ability and function, comfort, hygiene, esthetics, speech function, quality of life, cost, and fabrication time.

**Conclusions.** Although the studies reviewed demonstrate some advantages of simplified over traditional prostheses, such as lower cost and clinical time, good chewing efficiency, and a positive effect on the quality of life, the reports related the use of different simplified methods for the fabrication of complete dentures. Additional randomized controlled trials that used similar simplified techniques for the fabrication of complete dentures should be performed with larger sample sizes and longer follow-up periods. (J Prosthet Dent 2015;113:12-16)

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## Clinical Implications

The results of this systematic review may guide opinions concerning treatment with complete dentures. The changes proposed to simplify the traditional technique can influence both teaching and dental practice in the field of complete dentures and provide complete dentures that are less costly and more efficient, without decreasing technical quality or patient satisfaction.

the use of a semi-adjustable articulator with a facebow, wax evaluation, and occlusal adjustment in a semi-adjustable articulator. Any alternative method that eliminates any of the stages is called a simplified method, which means that the simplified method can vary among studies.

## MATERIAL AND METHODS

Electronic searches of the MEDLINE-PubMed, The Cochrane Library, and ISI Web of Science databases were performed by 3 independent examiners (Paulino,MR; Alves,LR and Calderon,PS) to identify clinical trials of the simplified and traditional fabrication of complete dentures published in English, up to December 2013 by combining search terms given in Table 1. All identified abstracts were read to determine whether they met the following inclusion and exclusion criteria. The inclusion criteria were human studies, randomized controlled clinical trial studies focused on comparing simplified methods and traditional method, and studies published in English. Exclusion criteria were case reports, literature reviews, and the absence of statistical analysis (Table 2). All titles revealed by this strategy were screened, and an abstract search was done to find further relevant articles. Repeated articles were considered only once. The full-text articles then were obtained and reviewed if this determination could not be made only with abstracts. The electronic search was completed by hand searching the references of selected articles. Data were obtained from all selected articles and included the following parameters: authors of articles, study design, sample (number of participants, sex, and age), treatment groups, follow-up period, and results that concerned the differences between the methods.

## RESULTS

The final electronic search of databases produced 277 records. 231=search through the electronic databases of descriptors; 7 = manual search of references from 18 articles. Subsequently, 19 full-text articles were screened according to the inclusion and exclusion criteria. Finally 6 articles were selected. These 6 articles were derived from 3 studies according to the authors. Details about the search strategy are

**Table 1.** Search methodology

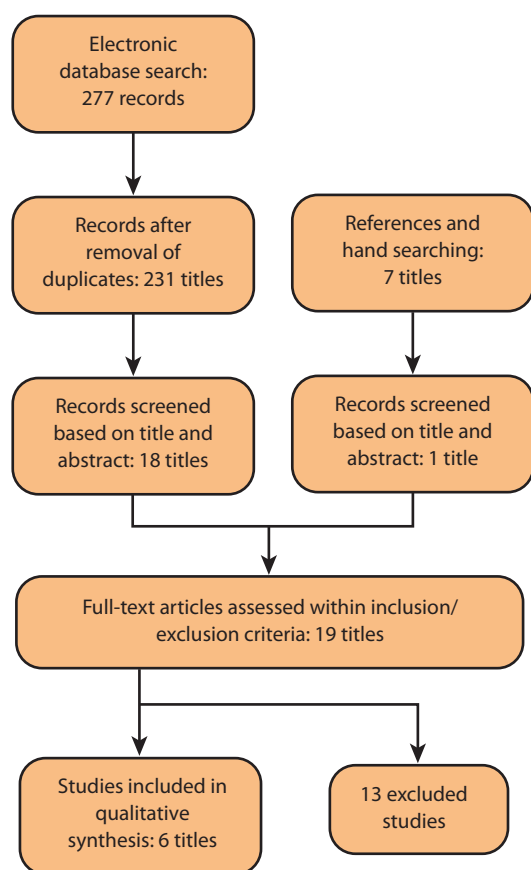
Electronic Search Keywords		
MEDLINE/PubMed	Cochrane Library	Web of Science
Denture and simplified technique	Denture and simplified technique	Denture and simplified technique
Simplified fabrication of complete dentures	Simplified fabrication of complete dentures	Simplified fabrication of complete dentures
Complete dental prosthesis and simplified technique	Complete dental prosthesis and simplified technique	Complete dental prosthesis and simplified technique
Denture and simplified and conventional and technique	Denture and simplified and conventional and technique	Denture and simplified and conventional and technique
Simplified and denture	Simplified and denture	Simplified and denture

**Table 2.** Exclusion criteria and excluded articles

Exclusion Criteria and Articles Excluded (n=13)
Literature reviews
Giusti and Pitigoi-aron, 2007 <sup>10</sup>
Duncan JP and Taylor TD, 2004 <sup>5</sup>
Preti et al, 2011 <sup>11</sup>
McCord, 2009 <sup>12</sup>
Clark et al, 2004 <sup>9</sup>
Not comparing techniques
Chauhan et al, 2012 <sup>13</sup>
Preti et al, 2012 <sup>14</sup>
Ellis, Pelekis and Thomason, 2007 <sup>15</sup>
Heath, Zoiopoulos and Griffiths, 1988 <sup>16</sup>
Kubrak, 1988 <sup>17</sup>
Nascimento et al, 2004 <sup>18</sup>
No statistical analysis
Harrison, Huggett and Murphy, 1990 <sup>19</sup>
Murphy, Bates and Huggett <sup>20</sup>

shown in Figure 1. All selected studies included randomized controlled trials. However, no statistical analyses were performed because of differences in study methodologies among the reports. The major characteristics and results of each study are listed in Table 3.

Six articles were included in the systematic review, however, they refer to 3 independent studies: study 1, Kawai et al<sup>6,7</sup>; study 2, Heydecke et al<sup>3</sup>; and study 3, Cunha et al<sup>1</sup>, Della Vecchia et al<sup>2</sup>, and Regis et al.<sup>8</sup> Thereby, in the selected studies, a total of 181 individuals ages 45 to 85 years were treated with complete dentures made by the traditional and simplified methods. Of these individuals, 101 were treated with the traditional method and 100 were treated with simplified methods. Only 1 study, Heydecke et al,<sup>3</sup> treated 20 patients with both methods at different times (crossover). The main differences between the treatments included the functional impression method, the use or not of a facebow, type of articulator, and the remount. The majority of the studies evaluated general satisfaction, denture stability, chewing ability and function, comfort,



**Figure 1.** Search strategy and results.

hygiene, esthetics, speech function, quality of life, cost of fabrication, and fabrication time.

Kawai et al<sup>6,7</sup> performed a randomized controlled clinical trial ( $n=122$ ) to compare traditional and simplified methods of making complete conventional dentures. A 100-mm visual analog scale (VAS) was used to evaluate satisfaction, comfort, stability, esthetics, ability to speak, ease of cleaning, and mastication at 3 and 6 months after treatment.<sup>6</sup> Denture quality was assessed by blinded professionals 6 months after treatment with a quantitative scale. No significant differences were found between the 2 groups in participant ratings for overall satisfaction (3 months,  $P=.970$ ; 6 months,  $P=.960$ ) or in denture quality evaluation ( $P=.380$ ). The direct costs of providing 1 set of complete dentures by the traditional or simplified methods were estimated. The clinician's time was recorded for every procedure. The results showed that the mean total cost of the traditional method was significantly greater than for the simplified method ( $P<.001$ ) and that clinicians spent 90 minutes longer for the traditional method ( $P<.001$ ). The investigators concluded that the simplified method was more cost efficient and that no negative consequences detracted from this cost saving.<sup>7</sup>

Heydecke et al<sup>3</sup> conducted a randomized controlled crossover trial with 20 participants to compare a

traditional technique (by using a facebow and lingualized teeth) with a simplified method that used anatomic teeth and canine guidance. Three months after treatment, participant ratings were obtained with a 100-mm VAS for general satisfaction, comfort, ability to speak, stability, esthetics, ease of cleaning, and ability to chew. At the end of the study (3 months after treatment with each method), all the participants were asked to compare the 2 methods. They rated their general satisfaction, stability, and esthetic appearance significantly higher for the simplified method ( $P<.05$ ). No significant differences between the 2 denture methods were detected for the ability to speak, comfort, chewing ability, or the ease of cleaning. "The authors concluded that using lingualized teeth did not appear to positively influence patient satisfaction when compared with anatomic teeth."<sup>3</sup>

One study, which resulted in 3 articles, was conducted as a randomized controlled clinical trial<sup>1,2,8</sup> to compare the simplified methods for complete denture fabrication with the traditional method with regard to masticatory performance and ability<sup>1</sup>; patients' oral health-related quality of life, satisfaction, and denture quality with the simplified method or the traditional method,<sup>8</sup> and the costs of complete denture fabrication with the simplified and a traditional method.<sup>2</sup>

The OHIP-EDENT (Oral Health Impact Profile for edentulous patients) was used to assess oral health-related quality of life, and an inventory was used to assess satisfaction. The investigators concluded that the simplified method was able to produce dentures with comparable quality with those produced by the traditional method.<sup>8</sup> Three months after the treatment, masticatory performance was evaluated by a colorimetric assay based on chewing capsules.<sup>1</sup> The values obtained for both edentulous groups did not show any significant difference. The masticatory ability assessment, evaluated by a 10-point VAS, did not show statistically significant differences between the traditional and the simplified groups ( $P=.699$ ). The study concluded that the simplified method was able to restore masticatory function comparably with a traditional protocol, according to participant perceptions.<sup>1</sup> The results revealed that complete denture fabrication demanded a median time of 173.2 minutes for the simplified group and 284.5 minutes for the traditional group ( $P<.05$ ).<sup>2</sup> The simplified group presented lower costs than traditional group during the fabrication stage but not during the follow-up stage. The direct cost of complete denture treatment was 34.9% lower for the simplified method.

## DISCUSSION

This study assigned PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statements<sup>10</sup> This study assigned PRISMA statements<sup>21</sup> for systematic

**Table 3.** Summary of results from systematic review

Study	Study Design	Sample	Variables (instruments)	Follow-up	Main Results
Kawai et al <sup>6,7</sup>	Single blind RCT	N = 122; T, 61; S, 61; age range, 45-75 y	General satisfaction, comfort, stability, esthetics, ability to speak, ease of cleaning, and mastication (VAS) <sup>a</sup> and denture quality (quantitative scale) <sup>a</sup> ; cost and time <sup>b</sup>	BL, 3 and 6 mo	General satisfaction <sup>a</sup> : at 3 mo, T=S ( $P=.970$ ), at 6 mo, T=S ( $P=.960$ ); denture quality <sup>a</sup> : 6 mo, T=S ( $P=.380$ ); cost <sup>b</sup> : 6 mo, T>S ( $P<.001$ ); clinician's time <sup>b</sup> : 6 mo, T>S ( $P<.001$ )
Heydecke et al <sup>3</sup>	Single blind CO RCT	N = 20; T, 20; S, 20; age range,	General satisfaction, comfort, ability to speak, stability, esthetics, ease of cleaning, occlusion, and ability to chew (VAS)	BL, 3 and 6 mo	General satisfaction, stability, and esthetics: T<S ( $P=.044$ , $P=.021$ , $P=.026$ , respectively); ability to speak, comfort, ease of cleaning, speech function, and chewing ability: T=S ( $P>.05$ )
Regis et al <sup>8</sup> ; Cunha et al <sup>1</sup> ; Della Vecchia et al <sup>2</sup>	RCT	N = 39; T, 20; S, 19; age range, 47-80 y	Quality of life (OHIP-EDENT) satisfaction (inventory) and quality (FAD), <sup>c</sup> and masticatory performance (colorimetric method); and masticatory ability (inventory) <sup>d</sup> and costs, time for denture production and postinsertion adjustment, (chronometer) <sup>e</sup>	BL, 3 and 6 mo	OHIP-EDENT: masticatory concerns: 3 mo, T=S ( $P=.067$ ), at 6 mo, T=S ( $P=.205$ ); psychological discomfort and disability: 3 mo, T=S ( $P=.160$ ), at 6 mo, T=S ( $P=.406$ ); social disability: 3 mo, T=S ( $P=.911$ ), at 6 mo, T=S ( $P=.359$ ); oral pain and discomfort: 3 mo, T=S ( $P=.145$ ), at 6 mo, T=S ( $P=.635$ ); satisfaction: 3 mo, T=S ( $P>.05$ ), except retention of lower denture and ability to speak: T<S ( $P=.043$ ; $P=.017$ , respectively), at 6 mo: T=S ( $P>.05$ ); denture quality: 3 mo, T=S ( $P=.828$ ); masticatory performance (colorimetric method): 3 mo, T=S ( $P>.05$ ); masticatory ability (inventory): 3 mo, T=S ( $P>.05$ ), except eating, T<S ( $P=.035$ ); cost: 3 mo, T>S ( $P<.05$ ); time for denture fabrication: 3 mo, T>S ( $P<.05$ ); time for postinsertion adjustment: 3 mo, T=S ( $P=.424$ )

RCT, randomized controlled trial; T, traditional; S, simplified; VAS, visual analog scale; BL, baseline; CO, crossover; OHIP-EDENT (Oral Health Impact Profile for edentulous patients); FAD, functional assessment of dentures.

<sup>a</sup>Ref 6.; <sup>b</sup>Ref 7.; <sup>c</sup>Ref 8.; <sup>d</sup>Ref 1.; <sup>e</sup>Ref 2.

reviews to evaluate the clinical efficiency of complete dentures made by simplified methods when compared with the traditional method. The search revealed a low number of studies in the literature that compared these methods in well-designed randomized clinical trials, defined by the NHMRC (National Health and Medical Research Council) guidelines<sup>22</sup> as level II, with blinded examiners and predefined follow-up evaluation periods. Acceptable sample sizes were verified in the majority of the studies. Unfortunately, a quantitative systematic review or meta-analysis was not conducted because of the different methodologies applied.

Denture fabrication methods taught by dental schools often demand a complex sequence of clinical and laboratory procedures based on the assumption that complex methods result in better treatment quality.<sup>1,2,8,9</sup> Nevertheless, the need for such procedures has been questioned because of the lack of evidence that dentures fabricated by complex methods are preferred by patients.<sup>1,2,7,8</sup> Another argument against the use of complex methods is the short time available for teaching complete denture prosthodontics at dental school.<sup>2,3,8</sup> Over recent years, several simplified methods for complete denture fabrication have been described.<sup>1-3,6-8</sup> Such approaches include simplification or even avoiding some clinical or laboratory procedures, and

claim to result in clinically adequate dentures with a lower use of resources, which suggests good applicability.

Three studies assessed the overall satisfaction of patients but showed different results. One of these studies showed statistical differences<sup>3</sup>; the other studies did not.<sup>6,8</sup> This difference can be explained by the differences in the sample size and in the methodology. In 3 studies, the simplified techniques were different from each other.<sup>3,6,8</sup> The assessment instruments also were different. VAS was used to assess overall patient satisfaction with the prosthesis in studies by Kawai et al<sup>6</sup> and Heydecke et al,<sup>3</sup> and a questionnaire was used by Regis et al<sup>8</sup> and Kawai et al<sup>6</sup>; Kawai et al<sup>6</sup> and Regis et al<sup>8</sup> found no significant differences between the simplified and traditional methods for overall satisfaction; however, Heydecke et al<sup>3</sup> reported better values for simplified methods. Kawai et al<sup>6</sup> and Regis et al<sup>8</sup> also analyzed the technical quality of the prosthesis and did not find statistically significant differences between the techniques. For this analysis, Kawai et al<sup>6</sup> recruited 4 blinded examiners and evaluated the prosthesis at the 6-month follow-up. However, Regis et al<sup>8</sup> recruited a single examiner for this assessment at the 3-month follow-up.

Cunha et al<sup>1</sup> proposed a quantitative analysis of masticatory efficiency by using the calorimetric technique



and found no difference among simplified groups, and Regis et al<sup>8</sup> analyzed the influence of oral health on quality of life through OHIP-EDENT (Oral Health Impact Profile for edentulous patients) and concluded that denture fabrication methods did not influence results. The investigators also stated that these findings were unexpected because it was predictable that simplified prostheses would demonstrate inferior results.

The assessment of differences in time and cost for simplified and traditional methods has been described in 2 studies (Kawai et al<sup>7</sup> and Della Vecchia et al<sup>2</sup>) that demonstrated that dentists and dental assistants needed less time for fabricating dentures with the simplified method than with the traditional method. This was expected because an average of 4 clinical sessions are needed for the simplified method, whereas the traditional method requires 5 to 6 sessions. Moreover, the final cost of the traditional method was significantly greater (23%,<sup>7</sup> 33.59%<sup>2</sup>). Among the studies, no significant differences between the 2 denture treatment methods were detected for the following variables: comfort, ease of cleaning, speech function, and chewing ability,<sup>1,3,6,7</sup> which supports the statement that there is no evidence that the traditional method produces greater patient satisfaction, better function, or higher quality dentures, even for cases classified as difficult to treat based on diagnostic findings.<sup>7</sup>

## CONCLUSIONS

The present systematic review revealed no difference in masticatory variables, patient satisfaction, or quality of conventional dentures produced with the traditional or the simplified methods, even if the simplified methods can vary among the studies. Therefore, analysis of the data indicates that some clinical or laboratory steps can be skipped, which saves clinical time and reduces costs without prejudicing the prosthesis. Dental schools should consider these findings when designing complete denture courses. Nevertheless, the evidence remains unclear because of the small number of available controlled and randomized clinical trials. Thus, further studies with a higher level of evidence, representative sample size, adequate follow-up period, and standardization of methods should be conducted to validate the performance of this treatment option.

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